developed in a plane perpendicular to the principal axis, as *flat* snow crystals. When, however, the atmospheric space is limited by a wall, first a small hexagonal disc of ice attaches itself to that wall. Then, as growth proceeds, in a calm or comparatively calm medium, the middle portion of the disc will be in contact with air robbed of its moisture, while the edges will grow outwards, the rate depending on the amount of food material. The open ends of the funnels will point towards the middle of the wall-bound air-chamber or cavern, or away from the wall; in the case of hoar-frost the funnels will be open towards the sky.

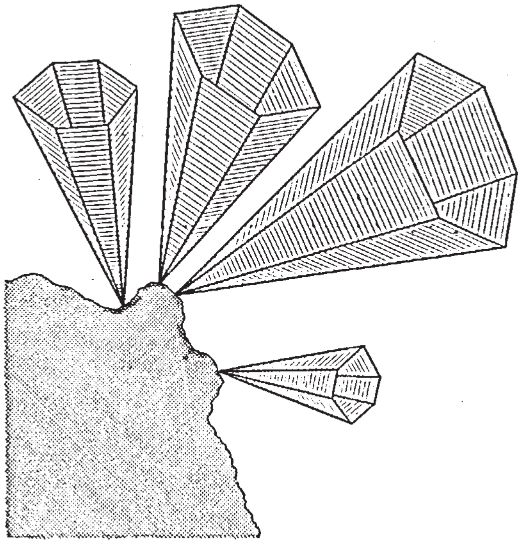

FIG. 2.—Hollow Hexagonal "Hopper" Crystals of Ice found in Surtshellir. (Natural size.)

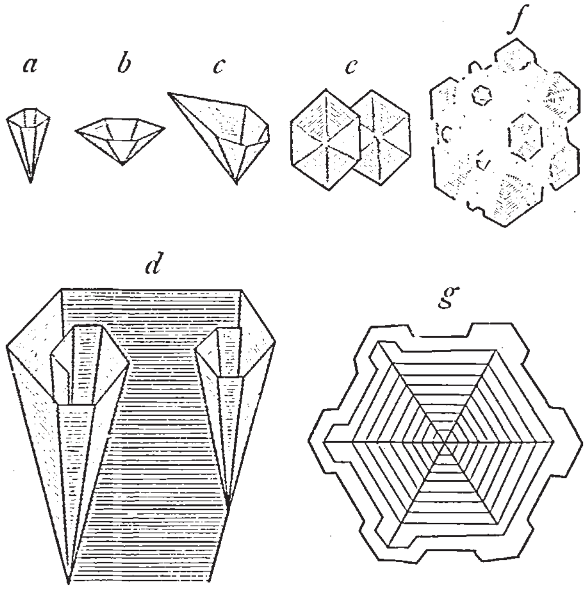

FIG. 3.—Natural Hoar-frost (Christmas 1892). (*a* and *f* natural size; *b*, *c*, *d*, *e* and *g* enlarged.)

This type of skeleton crystal may be termed *starvation crystal.*

By reflections from the steps seen on the triangular faces of the pyramids, we were able to show that they consist of combinations of faces of the hexagonal prism (∞ P) and the basal pinacoid (OP).

VI. *Literature.*—In 1697, Camerarius of Tübingen ("De figura nivis et pruinæ." *Misc. ac. natur.* Jenæ, Dec. 1697, p. 480) describes some hoar-frost on the lead bindings of windows as hexagonal discs, some of which had a central depression.

Dr. J. Krenner mentions, in his description of the ice cave of Dobschau ("A Dobsinai Jegbarlang." Budapest, 1874), flat hexagonal ice crystals, some depressed in the middle, or obtusely funnel-shaped.

In a paper entitled "Eine Krystallgrotte" (Groth's *Zeitschr. für Krystallographie*, 1888, xiv. p. 250), C. A. Hering mentions and illustrates fan-shaped ice crystals which probably are identical with those seen by Krenner, except that they are quite flat. On the upper surface of the fans some hexagonal hopper-shaped ice crystals were found.

VII. *Conclusions.*—(1) Water when changing direct from the gaseous into the solid state is highly crystalline.

(2) The tendency to crystallisation is so strong that in those cases where the area of supply is limited by a wall or other surface, skeleton crystals—hexagonal "hoppers"—are formed, growing away from the wall, even under circumstances of excessively slow growth.

(3) Calmness of air seems to be an essential condition for their formation.

(4) From our observations there can be no doubt as to the identity of the ice crystals of Surtshellir, of the refrigerating chambers and ships in Liverpool, and of the cooling cellars of the Berlin breweries, with natural hoar-frost.

THE GLACIAL SYSTEM OF THE ALPS.

ON the day following the close of the Sixth International Geological Congress an excursion, organised and conducted by Profs. Penck of Vienna, Brückner of Berne, and Dr. L. du Pasquier, left Lugano to visit the chief glacial deposits of the Alps. An excellent guide-book of permanent interest, entitled "Le Système Glaciaire des Alpes," had been prepared by the conductors of the excursion.

On the first day (September 17) the party, numbering thirty-five, took train to Sesto Calende, and descending the Ticino in boats, walked over the moraines of Lago Maggiore to Borgo Ticino. An excellent view of the morainic amphitheatre, which forms a loop round the southern end of the lake, and rises to 470 feet above its level, was obtained from the morainic Monte del Bosco. In the evening the party proceeded to Ivrea by rail.

Next day was spent in examining the celebrated moraines of Ivrea, which testify so eloquently to the size of the glacier that descended the valley of Aosta. From the northern morainic ridge (the Serra), which rises to a mean elevation of 1300 feet above the central depression, a good view of the great amphitheatre was obtained. Late at night Milan was reached.

On the 19th train was taken to Lonato at the southern end of the Lake of Garda, whence carriages were taken to Salò, on the western shore of the lake. On the way to Salò, most interesting evidence of three successive glaciations was seen. It is found that the moraines of the last glaciation show only a very thin weathered crust, whereas the moraines of the two previous glaciations are marked by a weathered crust called "ferretto," many feet thick, in which the pebbles, even of granite and gneiss, are so much decomposed as to be readily cut with a knife. The whole weathered crust has assumed a deep red-brown rust colour, whence the Italian name for it.

At Mocasina the unaltered lower part of a moraine of the second glaciation was seen overlying the much-weathered "ferretto" crust of a moraine of the first glaciation. At Benecco the unaltered moraine of the last glaciation

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overlies the "ferretto" crust of a moraine of the second glaciation. In the evening, Riva, at the head of the Lake of Garda, was reached by steamer.

On the 20th the party took train to Innsbruck. The following day was spent in examining the deposits at Hötting, close by the town.

The breccia of Hötting, considered by Penck a cemented cone of dejection or talus of rock-fragments, contains fossil plants (all but four of existing species). It overlies one moraine and underlies another, and is held to indicate an inter-glacial epoch.

On the 22nd Munich was reached, and some most interesting sections at Höllriegelskreut, seven and a half miles south of the city, were examined. Three successive fluvio-glacial deposits were seen, superposed one upon another, each corresponding to a separate glaciation. Here again the weathered (though not red) crust of the older fluvio-glacial deposits underlies the unaltered lower part of the succeeding deposit. The oldest of the three deposits (viz. the Deckenschotter, *alluvion des plateaux*) consists here almost exclusively of limestone pebbles, which are so solidly cemented together as to form a conglomerate used as a building stone.

The 23rd (last day of the excursion) was rainy, but the morainic amphitheatre of the Isar glacier around the Starnberger (Würm) See, near Munich, was examined as far as the weather would permit, and at the close of the excursion all members joined in an enthusiastic vote of thanks to its most excellent conductors.

B. HOBSON.

NOTES.

A FEW weeks ago the Paris *Figaro* opened a subscription list in order to enable the Pasteur Institute to supply Dr. Roux's anti-diphtheria serum to all medical applicants. The appeal has resulted in a sum equivalent to about £10,000 being raised. It is hoped that institutes in which experienced physicians will administer the cure will soon be established. The Paris Academy of Medicine has reported in favour of Dr. Roux's treatment.

WE learn with much regret that Mr. George Knott died at Cuckfield, Hayward's Heath, Sussex, on the 8th inst., at the age of fifty-eight. He was an eminent authority upon double and variable stars, to the observation of which he devoted his astronomical life. So long ago as 1861 he read his first paper before the Royal Astronomical Society, the subject being the variable star R. Valpecula. From that date to April 1892, when he communicated a series of observations of the magnitude of Nova Aurigæ, he contributed no less than twenty-four papers to the Society. In 1877 he completed a valuable series of micrometrical measures of double stars, taken by himself between 1860 and 1873. For many years he was a member of the Council of the Society. He was highly respected by his fellow workers, not only for his astronomical labours, but also for his sterling character. His death will be deeply regretted by all who were acquainted with him.

FROM a circular bearing the imprint of the University of Minnesota, Minneapolis, we learn that Mr. Clarke Barrows proposes to supply a complete up-to-date reference to all zoological literature by means of a card catalogue arranged alphabetically by authors, and supplemented with a subject catalogue. It is proposed to begin the catalogue with the current volumes of the more important periodicals devoting the whole, or a portion, of their space to zoology, to print the new titles as they appear, and take up the back volumes as rapidly as possible. It is hoped that arrangements will soon be made to get the titles of all other important zoological writings, and thus a catalogue of all the zoological literature not recorded in the "Bibliotheca Zoologica" up to 1861 will be produced. Each card will have printed upon it the name of the author of a zoological paper, the full title of the paper, and the name and date of the periodical in which it was published. The cards will be punched so that they can be stacked in drawers with a wire through them. They should be of great assistance to curators of zoological libraries.

THE Sunday Lecture Society will commence a new series of lectures next Sunday afternoon, at St. George's Hall, Langham Place, when Sir B. W. Richardson, F.R.S., will discourse on "Muscle and Athletic Skill."

THE steam yacht *Windward*, with Mr. Jackson's party on board, which left Archangel on August 5, is reported by the captain of a Norwegian walrus-hunting vessel, but the news is vague, being without exact dates, and the ship does not appear to have been "spoken." She was first seen about the middle of August off Matochkin Schar, the strait separating the two islands of Nova Zembla, where the ice was very heavy; and again about the end of August in lat. 75° 45′ N., and long. 44° E., steaming up a clear lead through rotten ice in the direction of Franz Josef Land.

MR. A. TREVOR-BATTYE and Mr. Hyland landed on the island of Kolguef, south-west of Nova Zembla, at the end of last June, with the special object of studying the ornithology of the island. His companion, Mr. Powis, returned for him in the steam-yacht *Saxon* on August 6, but not finding him at the landing place considered further search unnecessary and returned. Another Arctic steam-yacht made a remarkably cautious attempt to reach the island at a later date, but returned unsuccessfully, and Mr. Trevor-Battye has been left behind to face the Arctic winter without an adequate outfit. It is probable that when the winter ice unites the island to the continent, he will be able to cross to the mainland, a distance of less than sixty miles, and thence travel overland to St. Petersburg by sledge. It is to be hoped that he will be able to bring back his collections, which should be of considerable scientific value. A rescue expedition is proposed by Captain Battye-Trevor, but it is doubtful whether it can be carried out by sea at this advanced date. There seems no reason for anxiety, as game is usually plentiful on Kolguef, and there are habitable houses used temporarily in summer by Russians and Samoyedes.

WE have received a letter, written by Lieut. Peary to the President of the American Academy of Natural Sciences, which contains more detailed accounts of his expedition last season. When on the ice-cap in the spring of 1894, the average air-temperature experienced for forty-eight days was −31°·5 F., and the average wind velocity for forty-three days 15·9 miles an hour. During the worst weather there were thirty-four hours with an average temperature of −50° F. and a minimum of −62°, the average wind velocity being 48·1 miles per hour. The experience has convinced Mr. Peary that the human frame can stand any degree of natural cold without permanent injury. He intends to spend the coming winter in studying the Eskimo dog, and devising means to keep this invaluable animal alive and in health during extreme cold. There has evidently been some friction amongst the members of the exploring party, most of whom seem to have had enough of Arctic hardships, as the leader refers to the two men who remain with him as those who "decline to desert." The letter concludes: "You may rest assured that I shall not

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